IONIC PERMEABILITY OF THE CUTICLE AND IONOREGULATION IN DECAPOD CRUSTACEANS

The ionic permeabilities of the isolated gill cuticle have been deduced from diffusional transcuticular potential and conductance measurements in several species of decapod crustaceans. It is established that the cuticle permeability depends upon the species considered and its ionoregulation capability, upon the localisation of the gill in the gill chamber or even upon the topographic region in a single gill and upon the nature of the ionic species.

In each case the cuticle must always be considered as a diffusion barrier for the main osmotic effectors, Na^+ and Cl^-. However, the efficiency of this barrier is low in the case of the stenohaline osmoconformers, *Homarus*, *Nephrops*, *Maia*. In hyperregulators such as *Astacus*, *Eriocheir* and *Carcinus*, the efficiency of the cuticular barrier is much higher. The cuticle permeability of the crayfish gill lamina is low for all ionic species but Cl^-. In the crayfish gill filaments and in crab gills, permeability to cations is high, but permeability to Cl^- is low.

In hyperregulators, the cuticle exhibits important differences in its electrical characteristics between the various pairs of gills or even between different topographic regions of the same gill. It shows in addition a functional asymmetry which favours ionic influxes. This asymmetry is almost nonexistent in osmoconforming species.

The physiological significance of the cuticle is discussed in relation to the ionoregulation capability of the species and more particularly to the subcuticular spaces described in all gill epithelia of hyperregulatory Crustacea facing reduced salinity. It is propounded that the gill cuticle contributes to reduce ionic leaks in regulators and yet allows for the entry of ions across specific channels at the sites where active uptake takes place.

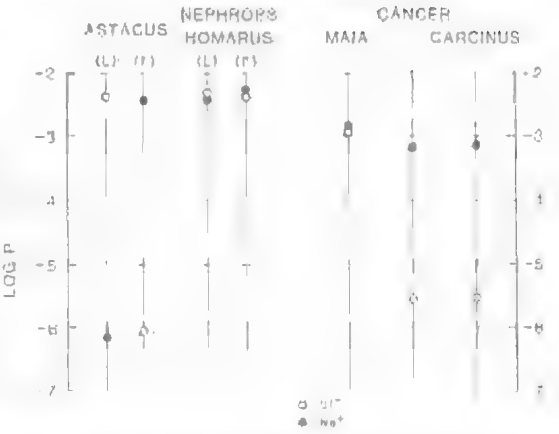

FIG. 1. Comparison of the permeability of the gill cuticle from six crustaceans to the main osmotic effectors Na^+ and Cl^-. The permeability (P) is plotted on a logarithmic scale. Notice the difference between regulators and osmoconformers either within the macrura or within the brachyura (L = gill lamina; F = gill filaments). Taking into account the electroneutrality condition, the following salt permeability sequence as related to the species would be : *Homarus*, *Nephrops* > *Maia* > *Cancer* > *Carcinus* > *Astacus*.

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NEUROENDOCRINE CONTROL OF THE OVARY AND HEPATOPANCREAS IN SIBERIAN PRAWN, *EXOPALAEMON MODESTUS*

In many decapod crustaceans, the eyestalks have an X-organ-sinus gland complex (XSC) as a neuroendocrine organ controlling various physiological phenomena such as colour change, moult, reproduction etc. Among the hormones synthesised in the XSC, gonad inhibiting hormone (GIH) is involved in the regulation of gonad maturation. Despite studies of eyestalk ablation in many species, the source of nutrients required for precocious gonad maturation, and the primary action site of GIH are not yet clear. The present study examined the effects of eyestalk factors, especially GIH, on ovarian maturation and hepatopancreatic metabolism when the eyestalks were ablated to block the GIH source.

Animals were collected from freshwater reservoirs, around the Seosan area on the west side of Korea, during the hibernating season. The prawns were transported to the laboratory and placed in a crustacean rearing chamber. The prawns were maintained in glass tanks equipped with sub-sand filters. The temperature was maintained at 25±1°C and photo-period was adjusted to 12hr light : 12hr dark. Animals were fed with chopped mussel and fish *ad libitum*. Eyestalks were ablated bilaterally by using small scissors and then cauterised. The ovaries and hepatopancreases were dissected out after two weeks for histological observation and biochemical determination (UV spectrophotometry).

Gonad index was increased more than 2% in ablated prawns compared with 0% for the controls. Mean oocyte diameter was also increased from 128 μm to 850 μm in eyestalk ablated prawns. The number of yolk granules in oocytes was markedly greater in eyestalkless than in intact prawns. The pyknotic index of hepatopancreas cells of ablated prawns was about 3 times greater than that of the controls. At the same time, a looser arrangement of hepatopancreas cells was observed after the operations than that seen in the tissue of the controls. The contents of total proteins, lipids and carbohydrates in the ovary of the destalked animals were significantly increased ($P<0.05$) although those in hepatopancreas were decreased coincidentally. However, the content of ribonucleic acid was not significantly different between two organs.

Based upon these results, the differences in biochemical constituents and the histological changes, demonstrate that organic reserves from the hepatopancreas might be mobilised into the ovary during ovarian maturation induced precociously by eyestalk ablation. The present results show that metabolic changes within the ovary and the hepatopancreas might be closely related and controlled by neuroendocrine factors.

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